

TYPE I PROGRESS REPORT NO. 5*
UNIVERSITY OF TENNESSEE AGRICULTURAL REMOTE SENSING
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E7.3 10849
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- (a) PROJECT TITLE: Utilization of ERTS data to detect plant diseases and nutrient deficiencies, soil types and moisture levels.

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- J. W. Hilty (Plant Diseases)
- J. C. Rennie (Forestry)

- (b) GSFC ID UN650 MMC #139, Contract No. NAS5-21873

- (c) Cloud cover has been the main problem for most of the spring and summer. A breakdown of the microdensitometer has caused delay in imagery evaluation but this instrument is now operational.

The dates on our standing order form for imagery indicate shorter coverage periods than we would have liked as these were completed before the delays of ERTS 1. Until we can get these dates extended, we are requesting imagery through use of microfilms, standard U.S. catalogs and data request forms.

- (d) Accomplishments

1. Delineation of Soil Associations: (Parks)

Extension of the soil associations delineation in Obion County to other counties south of Obion County has been made. The separation of the Mississippi Delta from the Memphis association (Loess) is clearly defined in ERTS imagery covering West Tennessee and Mississippi.

2. Crop Discrimination and Plant Disease Detection: (Hilty and Ellis)

Ground data on the extent of crop disease are being taken each month in Obion County and on Ames Plantation. The 5 acre area of disease susceptible corn planted at Ames is at a stage of growth that it should show on current imagery. Low altitude (8,000 ft.) aircraft imagery of this area was obtained on August 6th.

3. Forestry: (Rennie and Birth)

Interpretation of roll 21 of the NASA aircraft imagery was completed. This imagery was divided into 0.15" squares and each square was assigned to one of five volume classes. Completion of the assignment of volume classes on the aircraft imagery was the final step in the second stage of our four-stage sampling scheme.

The third and fourth stages consist of on-the-ground data collection. There are fifteen combinations of stand type (pine, hardwood and mixed) and volume class on the interpreted imagery. For volume class 1 (less than 200 cubic feet per acre) one sample location in each stand type

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(E73-10849) UTILIZATION OF ERTS DATA TO
DETECT PLANT DISEASES AND NUTRIENT
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LEVELS Progress Report (Tennessee Univ.)
3 p HC \$3.00

was selected randomly, for volume class 2 (200 to 1000 cu. ft./A.) three locations, for volume class 3 (1000-1400 cu. ft./A.) four locations, for volume class 4 (1400-2200 cu. ft./A.) and for volume class 5 (more than 2200 cu. ft./A.) six locations were selected in each stand type. This resulted in 57 sample locations to be visited on the ground.

At each sample location a five chain square is established to locate nine sampling points. At each sampling point trees will be selected for measurement with a BAF 10 prism. Using 3P sampling, a subsample of prism count trees will be selected for measurement with a Wheeler pentaprism ocular caliper to accurately determine tree volume.

Ten of the 57 ground plots have been completed. The field work will be completed by the middle of September.

4. Plant Diseases: (Hilty and Wills)

Currently orders are being prepared for all of the good, cloud-free imagery that is available for the sites under study. This is an effort to collect a uniform, time-segmented series of imagery of the target areas for use in comparing crop maturity, soil moisture, and soil temperature in a chronological order. With this series of imagery, changes in crop growth from one period to the next with corresponding changes in other areas of interest can better be observed.

A visual study of color-composite recently received indicates that soil moisture and soil temperature are better delineated by the color imagery than the black-and-white imagery of the same area and date. Color imagery also gives a much better delineation between field boundaries of different crops. This aids greatly in precisely locating smaller crop areas which previously were difficult to locate on the black-and-white imagery.

Using color imagery, the crops and land features have been color coded with the following results:

Dark blue	- Water
Bright red	- Cropland
Purplish red	- Forest
Green	- Wet areas of cropland

Relating to soil temperature, the following apparent results were obtained from visual analyses of the color-composite imagery:

Dark red	- Warmest areas
Purplish red	- Warm areas
Green	- Moderately cool
Blue	- Coolest areas

Imagery ordered to complete the mosaic of the West Tennessee target areas has not yet been received in the desired form. As soon as this imagery is received, the mosaic will be completed.

The use of computer densitometer printouts is continuing, although a malfunction in the computer tape unit of the scanning microdensitometer made it inoperable for the past several weeks. Techniques have been improved, and the quality of densitometer printouts is anticipated to be much better in the future.

Visual and computer-printout analyses of the black-and-white and color-composite images during the coming weeks are expected to yield further information on the gross delineation of land uses, soil-moisture characteristics, terrain features, and crops. The computer printout, optical density subranges for land uses were rather definitely established for the October 1 Ames Plantation imagery (Type II Prog. Rept. No. 2). However, this was for only one date. Previous studies have indicated that the subranges can be expected to change with seasons, atmospheric conditions, variations within dates, etc. Thus, similar studies of imagery on other dates are expected to yield information on variations in optical density changes over time for the same areas.

(e) Significant findings

The separation of the Mississippi Delta from the Memphis Association (Loess) is clearly defined in ERTS imagery covering West Tennessee and Mississippi.